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ABSTRACT

Pointing out that interactive video (IAV) represents a synthesis of four primary technologies--computers, television, visual design, and instructional design--this paper discusses the what, why, and how of IAV visuals. The features and relevant aspects of each technology are briefly discussed, as well as the impact of each of these technologies upon IAV both as a composite technology and as a medium of instruction. The four critical structural elements of IAV--interaction, video options, pacing options, and strategy options--are outlined, and it is noted that each of these elements is affected by hardware, software, and program variables, which, in turn, affect the design and selection of images. It is suggested that screen designers use a worksheet, as shown in Figure 1, to analyze each of the critical elements and reduce the number of unknowns before proceeding with the design process. Three "rules-to-go-by" when designing IAV still-visuals and a comprehensive list of "do's and don'ts" and other guidelines for creating IAV visuals conclude the paper. A list of 21 references is included. (DJR)

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VISUALS FOR INTERACTIVE VIDEO: OLD FASHIONED IMAGES FOR A NEW FANGLED TECHNOLOGY

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VISUALS FOR INTERACTIVE VIDEO:
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> The latest technological bandwagon is interactive videodisc.
> . . . . . .
> Interactive computer technologies (are) media in search of designs.
>
> — D.H. Jonassen, 1985 —

Many of us agree with Jonassen that interactive videodisc is the latest technological bandwagon. Why the excitement? Computer assisted instruction (CAI) is interactive. Instructional television (ITV) has video. CAI and ITV have been around for years — decades even. Then, what's so new or special about interactive video (IAV)? Nothing and everything. Nothing is really new. Everything is special.

The reason that everything about IAV is special is that this new fangled technology is one of those rare and wonderful examples of what happens when technologies merge. For lack of a better term, interactive video represents a technological synthesis. Coming together are two electronic technologies (computers and television) and two design technologies (instructional design and visual design). Other technologies may be converging, too, depending upon how you categorize areas of interest (e.g., work on artificial intelligence, learning and instructional theory, perception, and sundry branches of psychology and physics have had and will continue to have major influences upon the development of IAV.)

Since these technologies are merging, consideration of one is consideration of all. Accordingly, before narrowing our focus to the what, why and how of IAV visuals , we ought to take a quick glance at the new or improved features and other relevant aspects of microcomputers, television, and the systematic design of instruction. At the risk of being redundant, let us state that each of these emerging technologies has an impact both

upon IAV as a composite technology and upon IAV as a medium of instruction. This distinction is important because the technology exists to support the medium. Also, for many of us, media considerations are something with which we know how to deal. The large repository of baggage that goes along with "media" is part of the total IAV equation. Some of the baggage is useful. Some is a hinderance.

Relevant Computer Features:

1. Miniaturization. The prefix "micro" in front of computer no longer implies anything except the size of the box they package it in. This means that the features desired in the computer element of the IAV system can probably be had in a stand-alone system.

2. Powerful microprocessors. (With sophisticated operating systems.) As the architecture of these integrated circuits increases, so does the speed of operation, and the potential for access to ever larger chunks of random access memory. Nothing is more critical to the ability to rapidly handle (manipulate) digitized visual displays.

3. Peripherals and Tools. Graphics tools ranging from simple light pens, mouse gadgets, joy sticks, and graphics tablets to complete integrated image-capture-and-manipulation systems have revolutionized the field of graphic arts. Similar tools are available for producing displays of the printed word. Image processing and word processing are the new operant terms.

Relevant Television Features.

1. Optical disc systems. The laser disc, which on a single side provides 30 minutes of motion video or 54,000 randomly accessible still frames, is the item that makes possible all of the high performance characteristics. With the laser disc we get rapid program execution speed, massive content resources, and room to store more visuals than even the most ambitious

program designer is likely to want, need , or be able to provide.

2. Smaller tape formats. The emergence of 1/2-inch videotape as a suitable format for delivery of IAV programming has brought both the size and price down to acceptable levels. The small, affordable VIR is the poor folks' doorway to IAV. Although premastering of videodiscs is still being done on 3/4 inch and 1-inch equipment, the quality of 1/2-inch and even of 8-mm tape has risen to the point where more and more people will soon be able to afford to participate in the production of usable video images.

3. Frame-accurate search and editing. Although precise editing is not as critical for IAV as it is for television programming, the technology which allows motion sequences to be accessed at any designated coded location with absolute accuracy is crucial.

4. Special Effects. Television producers and editors today are limited in their image making only by their own creativity. These days even small studios have chroma key, character generators, multi-function switchers, film chains, and other tools to create or manipulte electronic displays. Such technically simple things as the ability to juxtapose or superimpose images are almost taken for granted in our modern world where network news programs use these and other sophisticated techniques dozens of times in each newscast.

Relevant Systematic Instructional Design Features.

1. Research findings. The scholarly literature of instructional design is skimpy, but useful none-the-less. The fact that there is an ever-growing body of information that provides guidelines for good practice cannot be ignored. Some of that literature is quite helpful and some is specific to IAV, e.g., see bibliographies by Kozen (1983) and Brodeur (1985).

2. Authoring Systems. These are computer programs that attempt to reduce computer programming to a decision making process, with the decisions based

upon design-of-instruction factors. Eventually this kind of tool will evolve to the point where it really won't be necessary to have computer programming skills in order to design IAV lessons.

3. Graphics Tools. Graphics tools do for the graphics designer what authoring systems do for course writers — they help the designer to get the computer to do its stuff. Some of the more powerful graphics programs come with built-in design templates that "do it all" for the designer once a data set is entered. That means that all the designer does is enter the numbers and choose a style of display. The computer organizes, calculates, does the layout, and comes up with a finished visual. Sometimes the product even looks good.

Critical Elements.

Just as there are four primary technologies merging to intertwine themselves in interactive video, so too are there four critical structural elements of IAV. They are:

* Interaction
* Video Options
* Pacing Options
* Strategy Options

Each critical element is affected by hardware, software, and program design factors (variables). In turn, each of the elements has an effect upon the design and selection of images. Obviously, with compounding of variables it is nearly impossible to conjure a single, simple set of 1-2-3 guidelines that will work for every IAV screen display design situation. Instead, it is suggested that screen designers may find it useful to use a job aid like Figure 1 to reduce the number of unknowns before proceeding with the design process. A separate worksheet will be required for each of the critical elements.

CRITICAL ELEMENT: _____	
FACTORS	IMPACT ON SCREEN DESIGN
Hardware:	
Software:	
Design:	

Figure 1. Worksheet for Clarifying Critical Elements

Once the critical elements are analyzed, the power and limitations of the visual designer's situation will be known. Design of IAV still-visuals can then begin with maximum assurance that the end product will be the best, most effective instructional visual that can be expected under the circumstances. Not the best possible—just the best that can be expected under the circumstances. That leads us to the first of three "Rules-to-go-by". (Rules that are not chisled in stone, these are merely things the author knows from somewhere deep in the solar plexus.)

RULE 1: Don't attempt to exceed the limitations imposed by local production constraints. Mostly that means that it's okay to stretch your limits on special occasions, but usually it is better to stay within the system constraints and avoid the overload breakdowns. With IAV there is a lurking temptation to show off the technical power of the medium rather than to pursue the instructional goal with the least cost, effort, and fanfare. That leads us to the next rule-to-go-by.

RULE 2: Visuals should complement the instructional context. This isn't a rule for IAV only, but the easier it is for us to deliver images, the more we need to remind ourselves of this truism. Whatever we put on the screen, it should not diminish the student's enthusiasm to learn, detract from the sound track or other learning materials, or waste the learner's time. If, instead, the image on the screen sustains or builds interest, adds to the composite body of learning materials, and offers an efficient learning opportunity, the visual will work and the designer will have been successful.

Rules 1 and 2 deal in generalities. The first provides advice about the environment. The second speaks to our purpose — instruction. One more rule is needed that offers a prescription for dealing with the details of creating visuals. Therefore:

RULE 3: Within reason, attempt to apply all available "standards" and guidelines. The line between artist and technician is hard to find. It is harder yet to find undisputed evidence that any particular kind of graphic, visual technique, or display formula is best. Nothing seems to work all of the time, and things that usually work are often improved if they are interchangeably used with other successful methods. The visual design state-of-the-art is about equal to that of medicine. If we follow accepted procedures of good practice and let research help us where it can, we will be considered good practitioners. The key words are "good practice" and "research".

The field of educational technology has generated at least a ton of materials that suggest good practice in visual design. (The author moved his files recently and knows whereof he speaks on this subject.) In all of that accumulated mass of ideas, results, advice, and examples, however, there isn't a single-document item known to the author that he could recommend as a checklist/guide-sheet that would cover enough points to really get somebody started designing IAV visuals. The list that follows, though far from exhaustive and only a first cut at the task, is offered to fill that void.

NOTE: The list is on separate pages so that readers can make copies. Those who do so are requested to give credit.

A List of Do's Don'ts, and Other Guidelines
for Creating Interactive Video Visuals

** : ** : ** : **

DO acquaint yourself with the relevant research literature. Or, seek out collections of principles, guidelines, and "How To" literature that have a basis in research. (e.g. see Fleming and Levy, 1978; Pipeline, Fall, 1982; Pettersson, et al, 1984; Petterson, 1985; Dwyer, 1978, 1983; and many, many others.)

DO make displays "attractive", appealing to both affective and cognitive objectives. (Martin & Briggs, 1986)

DO show things that can be seen, but are difficult to describe. There is a temptation with IAV to overuse words because text displays are so easy to create.

DO keep the sound (if there is a sound track) and the pictures on the same subject. The object is to have the senses complement each other rather than have discontinuity. Similarly, there should also be agreement between visualized text and pictorial/graphic imagery that appears in the same display. (Braden & Walker, 1983; Braden, 1982)

DO make displays easy to read or view.

DO restrict lists, sets, etc. to 7 items or less per display (Miller, 1968). Longer/larger groupings can be broken up in a variety of ways.

DO show only one primary concept or idea per visual display. (Several facts may be displayed so long as they all refer to a single, central subject.)

DO repeat whole displays or major segments of displays to reinforce learning.

DO repeat visual themes from one display to another. Repetition should be carefully planned to serve as a continuity bond as well as a memory aid.

DO use compatible color combinations. Pettersson et al (1984) have identified more than 30 acceptable two-color combinations for reading from CRT's. Contrast seems to be the most important consideration -- light images against dark backgrounds or dark against light. Dark backgrounds (black or brown) with white, yellow, green-yellow, grey, and cyan text tend to rank highest.

DO use an appropriate font size, e.g., use 25 characters of text per line for "TV applications", i.e.,if the image will be shown on a large screen to a group (Utz, 1983). For individualized interactive "frame" formats, use 40-45 characters per line. (Olson & Wilson, 1985; Grabinger & Amedeo, 1985) Occasionally use other sizes for variety or emphasis. For long segments of text (informational reading), use 70 characters per line. (Pettersson, 1985)

DO use headings and labels.

DO use a combination of upper and lower case, except for emphasis or for headings. (Olson & Wilson, 1985)

DO have a system for showing emphasis. For example, add emphasis via flashing or inverse text only for rare, extremely critical points. Use "quotation marks," underlines, and UPPER CASE whenever they will suffice, which will be most of the time. Use [boxes] and → arrows ← or a different color of text for mid-level emphasis.

DO be consistent in the location of program control information, that is, put help comments, directions, etc. that refer to the present screen in a window at the top of the screen. Put advance, review, and escape codes in a bottom window.

DO show abstract concepts indirectly (by showing their effects, by association, or by accepted symbols).(Alesandrini, 1985)

DO show visual analogies when concept transfer is a learning objective. (Alesandrini, 1985)

DO limit the number of colors used. Durrett and Trezona (1982) suggest four colors for beginners and no more than seven for experienced users.

DO evaluate every screen display for legibility and visibility characteristics (Whiteside & Blohm, 1984). Size of type, resolution of detail, contrast of figure-ground, and design features determine whether images are recognizable, readable, and "look okay."

DO adopt a set of style standards and then follow them. Conklin (1985) prepared a useful checklist for IAV style with items like these:

- Titles and single lines centered
- Even spacing between information that belongs together
- Flush left margin and ragged right margin
- Bullets to differentiate sequence of points
- Two spaces after a period
- No end-of-line hyphenation
- Numbers below 10 are written out.
- Decimals and fractions are written as numbers.
- Consistent symbol usage

TRY TO apply accepted artistic design principles. (e.g., as recommended in Minor & Frye, 1977, or Kemp & Dayton, 1985.)

TRY TO be upbeat. A positive attitude and a fast-paced tempo will help keep students attentive.

TRY TO be "friendly" or personal, but don't overdo use of the student's name. Instead, concentrate on ease of interaction.

TRY TO leave enough margin on all sides. (This applies for all kinds of displays and for "windows" as well as for full-screen displays.)

TRY TO use indentation and other visual cues to show organization, hierarchy, and relationships.

TRY TO have a balance of iconic and digital displays, appealing to both right and left brain hemispheres.

TRY TO apply Pettersson's (1984) guidelines when comparisons and/or discrimination of statistics are intended:

- It is easier to distinguish between lines than between areas or volumes (for charts and graphs).
- It is easier to distinguish between horizontal lines than vertical lines and lines in all other directions.
- Use columns rather than rows for the most important comparisons.
- Set colums and rows compactly and not artificially "spaced out" to fit the page.
- Bar charts are easier to read than line graphs.
- Horizontal bar charts with supporting text are the best bar chart choice.

AVOID crowded screens. (Leave some open space.) (Olson & Wilson, 1985)

AVOID abbreviations and acronyms that are not well known or defined in the program. (Olson & Wilson, 1985)

AVOID too much detail in diagrams, drawings, and illustrations. (Dwyer, 1983)

AVOID animation if other techniques will work. (The labor-to-benefit ratio is out of proportion to other visual designs.)

DON'T show things symbolically unless the meaning of the symbol is clear.

DON'T show irrelevant material.

DON'T show inaccurate information.

DON'T use fancy lettering fonts.

DON'T use color alone as a cue or prompt. Make the system usable by color-blind individuals. (Durrett & Trezona, 1982).

DON'T rely solely upon text to display abstract concepts.

DON'T overuse emphasis.

DON'T use a visual element as both a meaningful symbol and an emphasis cue. (e.g., if arrows are used to show flow, don't use them to point out key concepts also.)

DON'T hesitate to add to this list or to substitute your own personal experience for any of the above suggestions.

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